Chemistry 115 Name

Dr. Cary Willard

Exam 4a December 6, 2012

Multiple Choice (30 points)

Page 4 (4 points)

Page 5 (16 points)

Page 6 (19 points)

Page 7 (14 points)

Page 8 (17 points)

Total (100 points)

All work must be shown to receive credit. Give all answers to the correct number of significant figures

Avogadros number = 6.022 x 1023 /mol

Grossmont College

Periodic Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| IA |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | VIIA | NOBLE GASES |
| 1  **H**  1.008 | IIA |  |  |  |  |  |  |  |  |  | |  | IIIA | IVA | VA | VIA | 1  **H**  1.008 | 2  **He**  4.002 |
| 3  **Li**  6.941 | 4  **Be**  9.012 |  |  |  |  |  |  |  |  |  | |  | 5  **B**  10.81 | 6  **C**  12.01 | 7  **N**  14.01 | 8  **O**  16.00 | 9  **F**  19.00 | 10  **Ne**  20.18 |
| 11  **Na**  23.00 | 12  **Mg**  24.30 | IIIB | IVB | VB | VIB | VIIB | VIII VIII VIII | | | | IB | IIB | 13  **Al**  27.00 | 14  **Si**  28.09 | 15  **P**  30.97 | 16  **S**  32.06 | 17  **Cl**  35.45 | 18  **Ar**  39.95 |
| 19  **K**  39.10 | 20  **Ca**  40.08 | 21  **Sc**  44.96 | 22  **Ti**  47.90 | 23  **V**  50.94 | 24  **Cr**  52.00 | 25  **Mn**  54.94 | 26  **Fe**  55.85 | 27  **Co**  58.93 | 28  **Ni**  58.70 | | 29  **Cu**  63.55 | 30  **Zn**  65.38 | 31  **Ga**  69.72 | 32  **Ge**  72.59 | 33  **As**  74.92 | 34  **Se**  78.96 | 35  **Br**  79.90 | 36  **Kr**  83.80 |
| 37  **Rb**  85.47 | 38  **Sr**  87.62 | 39  **Y**  88.91 | 40  **Zr**  91.22 | 41  **Nb**  92.91 | 42  **Mo**  95.94 | 43  **Tc**  (99) | 44  **Ru**  101.1 | 45  **Rh**  102.9 | 46  **Pd**  106.4 | 47  **Ag**  107.9 | | 48  **Cd**  112.4 | 49  **In**  114.8 | 50  **Sn**  118.7 | 51  **Sb**  121.8 | 52  **Te**  127.6 | 53  **I**  126.9 | 54  **Xe**  131.3 |
| 55  **Cs**  132.9 | 56  **Ba**  137.3 | 57  **La**  138.9 | 72  **Hf**  178.5 | 73  **Ta**  180.9 | 74  **W**  183.9 | 75  **Re**  186.2 | 76  **Os**  190.2 | 77  **Ir**  192.2 | 78  **Pt**  195.1 | 79  **Au**  197.0 | | 80  **Hg**  200.6 | 81  **Tl**  204.4 | 82  **Pb**  207.2 | 83  **Bi**  209.0 | 84  **Po**  (209) | 85  **At**  (210) | 86  **Rn**  (222) |
| 87  **Fr**  (223) | 88  **Ra**  226.0 | 89  **Ac**  227.0 | 104  **Rf**  (261) | 105  **Db**  (262) | 106  **Sg**  (263) | 107  **Bh**  (262) | 108  **Hs**  (265) | 109  **Mt**  (266) | 110  **??**  (269) |  | |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 58  **Ce**  140.1 | 59  **Pr**  140.9 | 60  **Nd**  144.2 | 61  **Pm**  (147) | 62  **Sm**  150.4 | 63  **Eu**  152.0 | 64  **Gd**  157.3 | 65  **Tb**  158.9 | 66  **Dy**  162.5 | 67  **Ho**  164.9 | 68  **Er**  167.3 | 69  **Tm**  168.9 | 70  **Yb**  173.0 | 71  **Lu**  175.0 |
| 90  **Th**  232.0 | 91  **Pa**  231.0 | 92  **U**  238.0 | 93  **Np**  (237) | 94  **Pu**  (244) | 95  **Am**  (243) | 96  **Cm**  (247) | 97  **Bk**  (247) | 98  **Cf**  (251) | 99  **Es**  (252) | 100  **Fm**  (257) | 101  **Md**  (258) | 102  **No**  (259) | 103  **Lr**  (260) |

Lanthanide series

Actinide series

Part I – Multiple Choice (30 points)

1. Liquids which are capable of mixing and forming a solution are
   1. Unsaturated
   2. Miscible
   3. Dilute
   4. Immiscible
2. Bronsted and Lowry defined an acid as a(n)
   1. Proton donor
   2. Proton acceptor
   3. Electron donor
   4. Electron acceptor
3. Which is the hydronium ion?
   1. H +1
   2. H3O +1
   3. OH -1
   4. OH2 -1
4. Which pH is most alkaline?
   1. 12
   2. 1
   3. 5
   4. 7
5. What is the conjugate acid of NH3?
   1. NH2 -1
   2. NH -2
   3. N-3
   4. NH4 +1
6. What type of compound is composed of only carbon and hydrogen atoms?
   1. Carbohydrate
   2. Ester
   3. Hydrocarbon
   4. Carboxylic acid
7. Which hydrocarbon series is saturated?
   1. Alkenes
   2. Alkynes
   3. Aromatics
   4. Alkanes
8. Which hydrocarbon series contains a triple covalent bond between carbon atoms?
   1. Alkynes
   2. Alkanes
   3. Alkenes
   4. Aromatics
9. Two or more different compounds with the same molecular formula are
   1. Isomers
   2. Isotopes
   3. Hypermeres
   4. Hypertopes
10. Sugars are examples of
    1. Nucleic acids
    2. Proteins
    3. Hydrocarbons
    4. Carbohydrates
11. A nuclear equation is balanced when
    1. the same particles and atoms are on both sides of the equation.
    2. different particles and atoms are on both sides of the equation.
    3. the charges of the particles and atoms are the same on both sides of the equation.
    4. the same elements are found on both sides of the equation.
    5. the sum of the mass numbers and the sum of the atomic numbers of the particles and atoms are the same on both sides of the equation.
12. Why is it important that radioisotopes used in diagnostic tests have short half-lives?
    1. These radioisotopes have a greater activity so they are easier to monitor.
    2. This minimizes the harmful side effects of the radiation.
    3. This is necessary so the radioisotopes will have high energy.
    4. These radioisotopes are less expensive.
    5. These radioisotopes are more abundant in nature.
13. The half-life of a radioisotope is
    1. one-half of the time it takes for the radioisotope to completely decay to a nonradioactive isotope.
    2. the time it takes for one-half of the sample to decay to a new isotope.
    3. the time it takes for the radioisotope to become an isotope with one-half of the atomic weight of the original radioisotope.
    4. the time it takes for the radioisotope to become an isotope with one-half the atomic number of the original radioisotope.
    5. the time it takes for the radioisotope to lose one-half of its neutrons.
14. Enzymes are
    1. Carbohydrates
    2. Proteins
    3. Oils
    4. Fats
15. Proteins are polymers of
    1. Amino acids
    2. Glucose
    3. Glycerol
    4. Amylose

Problems (70 points)

1. (4 points) A hospital saline solution is analyzed to verify its concentration. A 50.0 mL sample of the solution with a mass of 50.320 g is evaporated to dryness. If the solid sodium chloride residue has a mass of 3.84 g, what was the mass percent of sodium chloride in the original solution?
2. (4 points) Tartaric acid is found in grapes and often precipitates in casks of wine as they ferment. Calculate the molarity of a solution prepared by dissolving 8.423 grams of tartaric acid H2C4H4O6(150.1 g/mol) in enough water to make 75.00 mL of solution.
3. (4 points) Calculate the number of molecules of ribose in 73.45 mL of a 1.374 M solution of ribose, C5H10O5 (150.13 g/mol).
4. (4 points) How many mL of a 5.245 M solution of phosphoric acid, H3PO4 (97.99 g/mol) are needed to prepare 2.500 L of a 0.2481 M phosphoric acid solution?
5. (4 points) Write the correct chemical formula for the following acids
   1. Hydrochloric acid

HCl

* 1. Sulfuric acid

H2SO4

1. (6 points) Predict whether each of the following is soluble in water, hexane, or both. Justify your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| Substance | Soluble in water | Soluble in hexane | Explanation |
|  | Yes | Yes | Both polar and non-polar regions. Soluble in both polar and non-polar solvents |
|  | No | Yes | Non-polar, soluble in nonpolar organic solvents |

1. (4 points) How does the solubility vary with temperature? Compare the effect of temperature change on gases, liquids, and solids.

Solids and liquids are generally more soluble at high temperatures. Gases are always more soluble at low temperatures.

1. (3 points) The formula for citric acid is generally written as H3C6H5O7 rather than C6H8O7. Explain why.

By writing three Hs out front we indicate that there are three acidic hydrogens in citric acid.

1. (6 points) Write balanced nuclear equations for
   1. The decay of by alpha particle emission
   2. The decay of by beta particle emission
2. (8 points) A 25.00 ml sample of citric acid was titrated with 41.08 ml of 0.2719 M NaOH. Calculate the molarity of citric acid in the sample. (Hint: the table below may help to organize your thoughts to solve this problem.

H3C6H5O7 + 3 NaOH ⎯→ Na3C6H5O7 + 3 H2O

|  |  |
| --- | --- |
| Moles NaOH used to titrate sample |  |
| Moles citric acid in the sample |  |
| Molarity citric acid |  |

1. (6 points) A solution has an H3O+ concentration of 4.78 x 10-9 M.
   1. Determine the pH of the solution.
   2. Determine the pOH of the solution.
2. (3 points) A solution has a pH of 5.834. Calculate the hydronium ion concentration in the solution.
3. (4 points) Give the IUPAC name of

2,3-dimethyl heptane

1. (4 points) Draw a condensed structural formula for 2-heptene.



1. (3 points) What is the difference between saturated and unsaturated fats?

Saturated fats have only single bonds, unsaturated fats have some double bonds.

1. (3 points) What is the function of an enzyme?

To catalyze biochemical reactions and allow them to occur at a reasonable rate at body temperature.